

Some Notes on the Book:
The Handbook of Pairs Trading:
Strategies Using Equities, Options, and Futures
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Chapter 5: The Arbitrage Factors

Notes on the Text

Notes on Risk Analysis

Here I found the notation of the book is a bit confusing so I've changed it a bit when working through this section of these notes. Consider a portfolio with a long position of absolute value V_A of stock A and a short position in stock B of absolute value V_B then our total portfolio has a value of

$$V = V_A - V_B.$$

The value of a stock in a portfolio is the price of the stock times the number of shares we are long/short so we can write V in this case as

$$V = N_A p_A - N_B p_B.$$

Here both N_A and N_B are positive numbers. The change in our portfolio is given as

$$\Delta V = V_A r_A - V_B r_B = N_A p_A r_A - N_B p_B r_B,$$

where r_A and r_B are the returns of the A and B stock. If we want to construct a “market neutral paired portfolio” then we should pick the shares N_A and N_B in a special way. If we take historic data and regress the returns of A onto the returns of B i.e. create a linear model

$$r_A = \beta_{A|B} r_B + \epsilon,$$

that *predicts* the returns of A given the returns of B . If we assume that this relationship is true, in terms of r_B only, the change to the portfolio now becomes

$$\begin{aligned} \Delta V &= N_A p_A (\beta_{A|B} r_B + \epsilon) - N_B p_B r_B \\ &= (N_A p_A \beta_{A|B} - N_B p_B) r_B + \epsilon N_A p_A. \end{aligned}$$

Thus we see that if we pick the shares N_A and N_B such that

$$N_A p_A \beta_{A|B} = N_B p_B, \tag{1}$$

then the coefficient of r_B vanishes and we have constructed our desired market neutral portfolio. As an additional comment on this procedure note that we could reverse the labels on the stocks exchanging them if needed to pick the ordering of the stocks in the pair such that the variance of the idiosyncratic risk term, ϵ , is as small as possible.

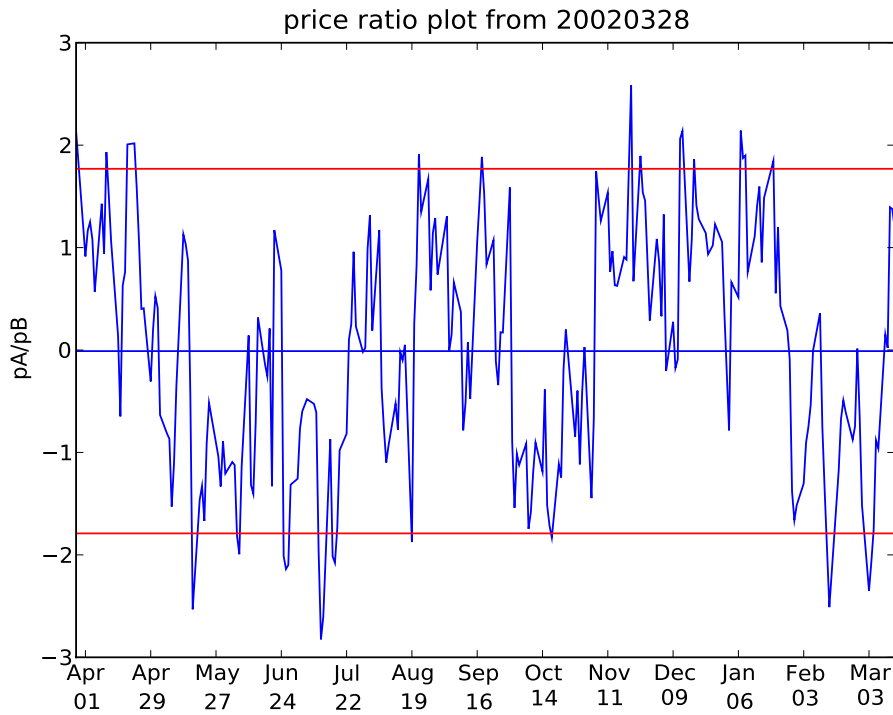


Figure 1: A duplication of the books figure 6.1.

Chapter 6: Arbitrage and Pairs Trading

Notes on the Text

Notes on Normalizing Pairs Divergence

In Figure 1 we duplicate the plot of the *ratio* of prices for GM and Daimier Chrysler DCX. This plot is qualitatively similar to the same one from the book and nicely shows the mean reverting behavior needed for pairs trading.

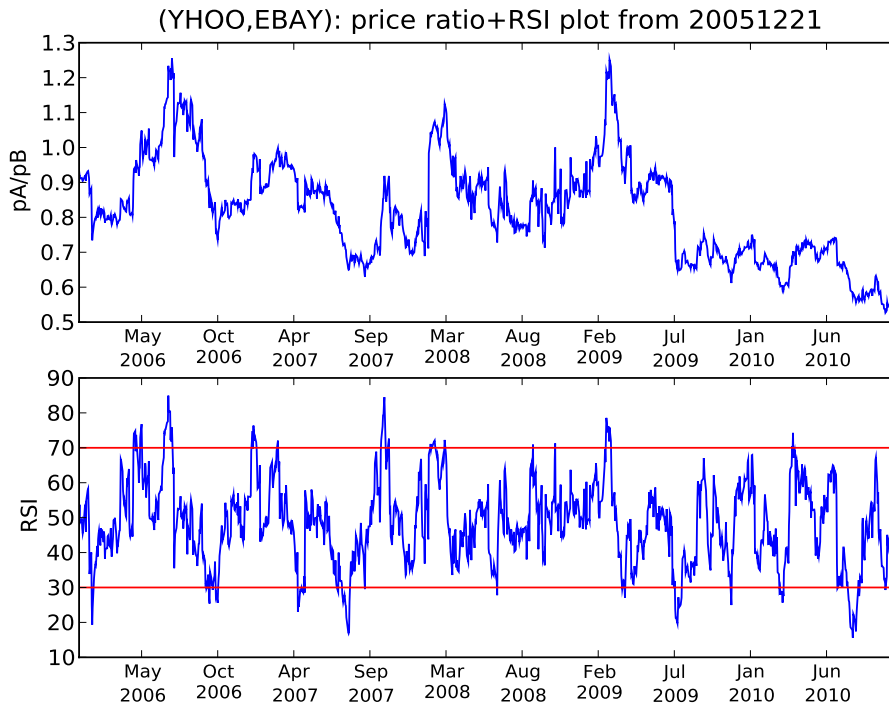


Figure 2: A plot of the relative price relationship between YHOO and EBAY (top) and the RSI of this ratio (bottom). Horizontal lines in the RSI plot are drawn at 70 and 30 traditional values that represent overbought and oversold thresholds.

Chapter 7: Technical Tools and Indicators

Notes on the Text

Notes on trading pairs with the Relative Strength Index (RSI)

A plot of the ratio of the price of YHOO relative to the price of EBAY (top) and its Relative Strength Index (RSI) on the bottom is shown in Figure 2.

Motivated from this figure, a very simple RSI based pairs strategy would be to go long the spread when the RSI of the price ratio $\frac{p_A}{p_B}$ falls below a lower threshold and to go short the spread when the RSI of the price ratio rises above an upper threshold. This means that if we find that the RSI of the price ratio is in the oversold region we go long the stock A and short the stock B . If we find the RSI of the price ration in the overbought region we short A and go long B . We would do this in share quantities such that we maintain a market neutral portfolio between the two stocks (see Page 2).

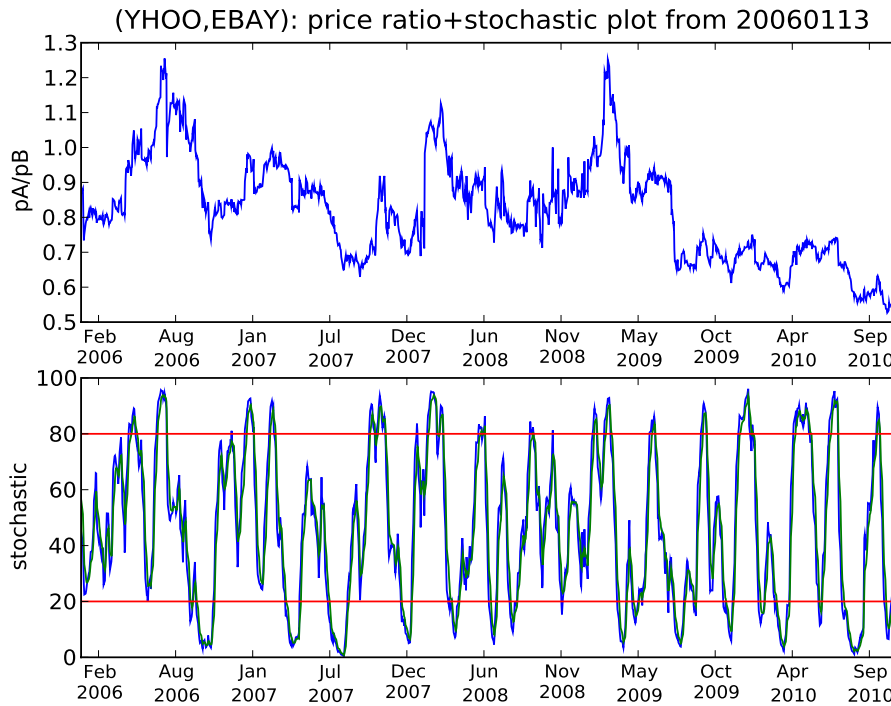


Figure 3: A plot of the relative relationship between YHOO and EBAY (top) and the fast %K and slow %D of this ratio (bottom). Horizontal lines are drawn at 80 and 20 traditional values that represent overbought and oversold thresholds.

Notes on trading pairs with Stochastics

A plot of the ratio of the price of YHOO relative to the price of EBAY (top) and the stochastics for this ratio on the bottom is shown in Figure 3.

In this section we discuss simple entry methods for pairs trading using the stochastic oscillator. To begin, recall that since %D is a smoothed version of the %K line, the %K is a *faster* signal (changes more quickly) than the %D line. Thus the crossing of the the %D line by the %K line will be considered a trigger to enter a trade. We will consider the price ratio oversold when *both* the %K and %D lines are below the oversold threshold (normally 20) and we will consider the price ratio overbought when *both* the %K and %D lines are above the overbought threshold (normally 80). When the price ratio is oversold we enter a long spread position when the %K line crosses above the %D line. When the price ratio is overbought we enter a short spread position when the %K line crosses below the %D line.

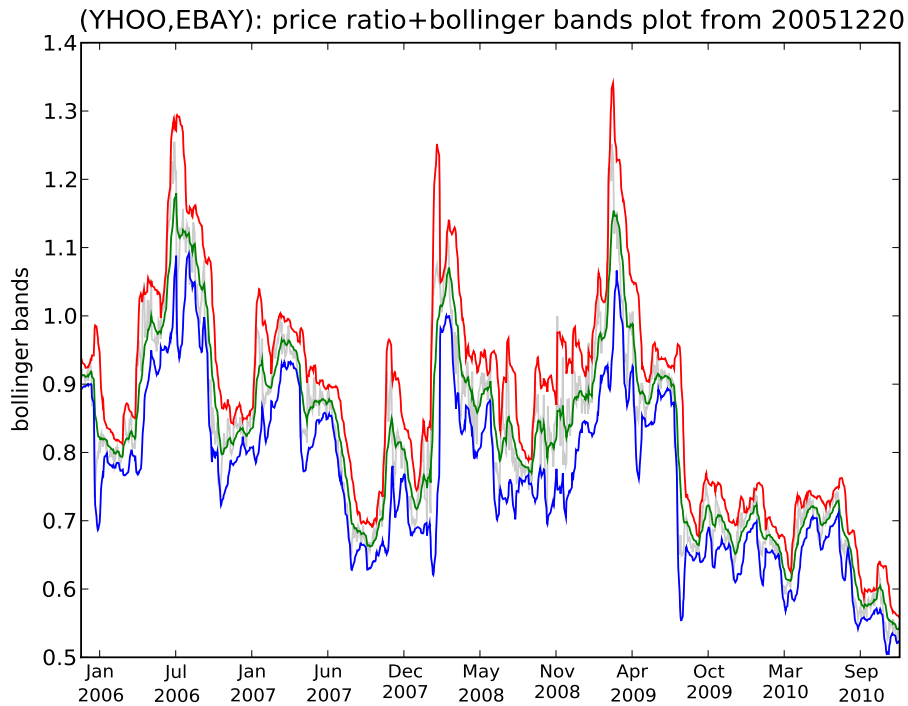


Figure 4: A plot of the relative relationship between YHOO and EBAY (top) and the associated 2 standard deviation Bollinger bands.

Notes on trading pairs with Bollinger Bands

A plot of the ratio of the price of YHOO relative to the price of EBAY (top) and the upper and lower Bollinger bands is shown in Figure 4.

In this section we discuss simple entry methods for pairs trading using Bollinger bands. The simplest strategy using Bollinger bands is to enter a short pairs position when the price ratio is above the upper Bollinger band and to enter a long pairs position when the price ratio is below the lower Bollinger band.

Notes on trading pairs with Bollinger Bands with RSI

As a modification of the above Bollinger band based entry strategy we only enter a long pairs trade when the price ratio is below the lower Bollinger band *and* the RSI of the price ratio is in the oversold region. In the same way we only enter a short position when the price ratio is above the upper Bollinger band and the RSI is in the overbought region. In this way we are hoping to use the RSI to filter out trending regions of the spread and only focus on regions where the spread is truly oscillatory.